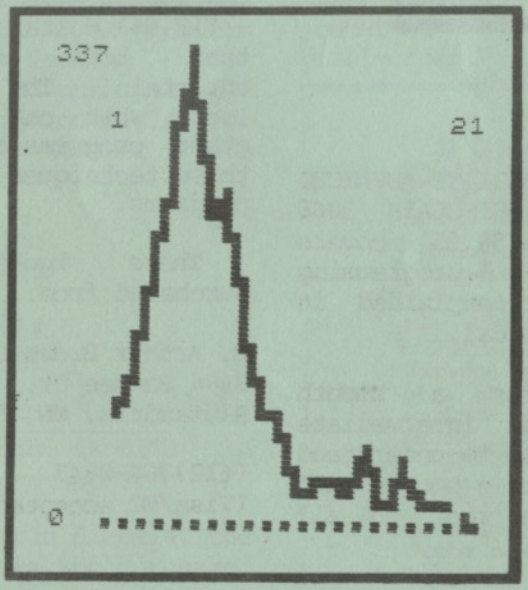
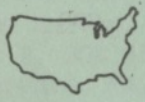
SYNCHRO—SETTE

THE SUBSCRIPTION MAGAZINE FOR YOUR MICRO COMPUTER
TIMEX — SINCLAIR





EDITOR RAMBLINGS 2
BINARY TEACHER - program 1000/2068 4
2068 LINE RE-NUMBERING 6
THE COMPUTER TUTOR - data point graphing 7
LETTERS TO THE EDITOR 9
STICK IT TO TIMEX 11
TS-2068 READ, DATA, RESTORE - tutorial 13
WHAT THE TS-2068 OWNER WON'T GET 15

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EDITOR RAMBLINGS

TS-2068 BOOKS

- The INTERMEDIATE-ADVANCED GUIDE TO TIMEX SINCLAIR 2068 (#119-502 - $9.95) covers advanced programming techniques not explained in the standard manual.

Written for a smooth translation from intermediate skills with easy-to-understand explanations, this book should be a welcome tool to all TS-2068 owners.

- BEGINNERS INTERMEDIATE GUIDE TO THE TIMEX-SINCLAIR 2068 (#119-501 - $9.95) is an in-depth and easy-to-understand guide that is supplemental to the standard manual.

It gets into much more useful applications and gives clearer explanations.

- THE TIMEX-SINCLAIR 2068 EXPLORED (#138-500 - $12.95) is a step by step guide through all the features and capabilities of the TS-2068. Programming is taught in BASIC and MACHINE CODE.

- THE TIMEX-SINCLAIR 2068/WHAT CAN YOU DO WITH IT? (#138-501 - $12.95) contains 50 programs that both educate and entertain. The idea is to learn what can be done in other programs and then apply these techniques to your own programs.

These books can be purchased from:

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Alexandria, MN, 56308

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SYNTAX TO CONTINUE

Unlike RAMBLINGS, SYNC and TS-USER (and ourselves) who chose to stop publishing a Timex/Sinclair oriented magazine, the Harvard Group intends to continue publishing their monthly newsletter.

Their publication was started to support the original Sinclair ZX-80 and at one time was endorsed by

original Sinclair ZX-80 and at one time was endorsed by Sinclair with an issue included free with any Sinclair computer hardware product sold by mail order.

SYNTAX has many technical articles on all TS/ZX products and is looking for advertisers. A one year (12 issue) subscription sells for $29.00. For further info contact:

SYNTAX ZX80, Inc.
The Harvard Group
RD 2, BOX 457
Harvard, MA, 01451

NEW TS PURCHASERS IN BIND

As logic would dictate, the bargain hunters who purchased Timex computer products at record discount prices are contacting supporting companies, only to find out that most of them are no longer in the business.

We have heard stories from people, many of whom are first time users, that they are without outside support for their machines.

Some have gone as far as to purchase pre-dated subscriptions to SYNCHRO-SETTE (which of course have cassette tapes for the 1000) just to get information about the TS-2068.

I can relate to the desperation that must occur when someone purchases a powerful computer like the TS-2068 and finds that support is limited and must be received entirely by mail-order.

When Workers Help Make Decisions—Productivity Rises

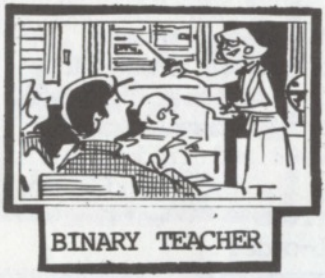
A study released by the New York Stock Exchange indicates that worker participation in the decisions of a company stimulates employee productivity and morale.

Highlights of that report include:

- "Gain sharing" can also stimulate productivity. Worker attitudes can change dramatically when workers are offered a piece of the action.

William M. Batten, chairman of the New York Stock Exchange, said: "Productivity isn't everything, it's the only thing. The simple fact is that without a rise in output per worker-hour, there can be no sustained growth in income per person."

- There are important lessons American business can learn from the Japanese, but there are Japanese practices that should not be adopted by U.S. firms such as attitudes toward women in management.
- Intensive on-the-job training and intern programs contribute to a better understanding among managers of how to work effectively within the organization.



Many students of computer math become confused when it comes to concepts involving computer math. A computer can be thought of as a hotel with a certain number of floors and a certain number of rooms per floor. If the computer uses an 8 bit microprocessor, such as the Timex machines (Zilog Z-80 chip) do, there would be 64 floors with 1024 rooms per floor.

Now, if you have a 16K TS-1000, the floors from 1 to 16 are occupied by the machinery that make the computer work, such as the BASIC language and routines that control the CRT (or TV), the recorder input & output, the keyboard. etc.

These floors of rooms or memory areas are called ROM which stands for Read Only Memory. What is in these rooms are numbers between 0 and 255. They cannot be altered by entry from the keyboard or recorder.

The floors between 17 and 32 are the RAM or Random Access Memory rooms and also can hold numbers between 0 and 255. The difference is that the user can control which numbers go into these rooms.

Since this is a 16K machine, the floors between 33 and 64 are locked out and unattainable to the user. It is like they are there but there are no rooms to put the numbers in since they haven't been built yet.

To help visualize how the computer stores these numbers in memory, picture in each of the rooms, a device that has 8 light bulbs on it. These bulbs represent the 8 bits in a byte. Each bulb can be in one of two states - either it is lit or it is not lit. If all the bulbs were lit, the number being held in that room would be 255. If none of them were lit, it would be 0. The following numeric values would be assigned to the bulbs from left to right:

BULB #	LIT -	NOT LIT
1	128	0
2	64	0
3	32	0
4	16	0
5	8	0
6	4	0
7	2	0
8	1	0

You will notice that the numbers when the bulbs are lit, represent powers of the number 2 but what you might not have known is that ANY NUMBER FROM 0 TO 255 CAN BE REPRESENTED BY THE SUM OF A COMBINATION OF THESE NUMBERS!

Computers use numbers from 0 to 255 to represent letters (both upper & lower case on some) numbers, logical operators, etc. On the TS-1000, the letter "A" is represented by the number 38. On the 2068 it is 65. The 2068 uses ASCII code which is the accepted code set for almost all computers. The command "PRINT CHR$ (65)" will result with "A" on almost all computers.

If a certain memory location of the TS-1000 held the information for the letter "A" and we PEEKed that location, we would find the number 38. The computer, however, looks at the eight bits in that location and sees the eight digit number 00100110. If we pictured this as the series of 8 light bulbs, and we were reading from right to left with the right-most bulb being #0 and the left-most bulb being #7, bulbs number 1,2 and 5 would be lit and the rest would be off.

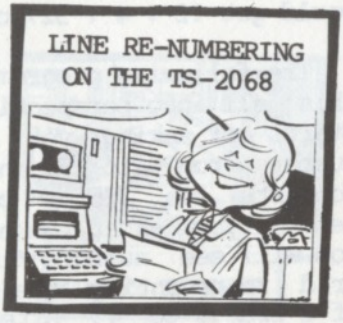
If we were to add (2 ** 1) plus (2 ** 2) plus (2 ** 5) we would get (2 + 4 + 32) or 38.

The following program puts this all into perspective. It starts off asking you for a number from 0 to 255 and then converts in into binary. Before you enter the number, you will see numbers in the grid representing the powers of 2 from 0 to 7. After the program calculates the binary equivalent, it will display it and blot out the power numbers not used. If the numbers left are added together, the sum will equal the inputted number.

The way this program works is by scanning the inputted number 8 times and comparing it to see if it is larger or equal to one of the powers of 2 starting with the largest one (128). If it is larger or equal to this power number, it subtracts the power number from the input number and puts a "1" in the appropriate binary number position. If the input number is smaller than the power number, it just puts a "0" in the appropriate binary number position.

This program will also work on the TS-2068. Remove the FAST & SLOW commands - Ed.

Fresh peas should squeak when the pods are rubbed together. Store them unshelled in your refrigerator.



Line renumbering for the TS-1000 required typing in a routine at the end of an existing program. The TS-2068 has the advantage of having a MERGE command which allows the user to merge a routine into an existing program without typing it in every time. I used this program to renumber a 220 line program and it did so in about 5 minutes.

The TS-1000 routine would sometimes renumber a portion of the program and the remainder would be garbled. This seemed particularly true if the program was over 50 lines long. RENUM-2000 renumbered 200 lines correctly but merged one line with another. The two lines had to be re-entered.

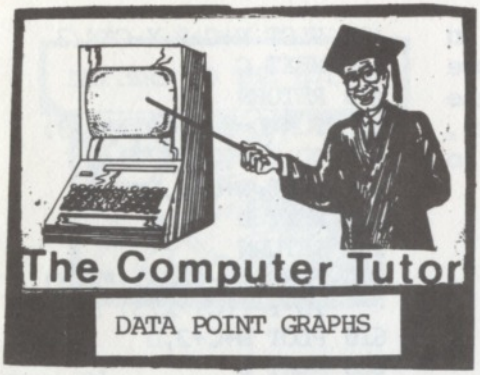
As in the TS-1000 version, the GOTO and GOSUB line addresses have to be edited manually and as in any program that is merged, it will overwrite any lines that exist in the first program.

The routine ends by asking the user if the RENUM-2000 routine is to be deleted.

To use RENUM-2000, first type it in and save it on tape under the name "RENUM-2000". Now load in the program to be renumbered. Now put the RENUM-2000 tape into the recorder and enter MERGE "RENUM-2000" or MERGE "". To execute the routine, type in GOTO 9986. The first prompt is for what you want the first line number to be and the second prompt is for how many numbers are to be incremented between line numbers.

After the second number is inputted, there will be a pause as the lines are being renumbered. The new line numbers will appear in the upper left corner of the screen. When the renumbering is finished, the renumbered program will list itself.

```
9985 STOP
9986 INPUT "Starting line
number? ";s
9987 INPUT "Increment number?
";i
9988 CLS: LET a=26710: LET
b=s
9990 POKE a,INT (b/256)
9991    POKE   a+1,b-256*INT
(b/256):
    PRINT AT 0,0;b
9992 LET b=b+i
9993 LET a=a+i
9994 IF 256*PEEK a+PEEK (a+1)
    = 9985 THEN GOTO 9997
```



Good morning, Class! Today's session will be on data point graphs. In the December 1982 issue, we discussed creating graphs on the screen that would show data points with connecting lines. The original program routine that created this was limited in the respect that only 12 sales entries could be entered. The screen was divided into 2 sections in which the left section of 8 columns was for data identification and the right 24 columns would contain the plotted graph.

Since each column can contain 2 subcolumns for the points being plotted, the routine would have three columns between points to use for connecting lines so that the graph could be easily visualized. This of course made for limited entry of only 12 data items.

It is possible to have as many as 64 data items entered but I decided to write a routine that would allow 24 entries and use only one sub-column for connecting lines. This program is at the end of this text.

The lines from 10 to 80. allow up to 24 data entries with line 40 terminating entry if the amount is less than 24.

The lines from 100 to 150 determine which entry is the largest so that the graph, when displayed, will have the highest peak at the very top of the screen down to zero sales at the bottom of the screen.

The lines from 200 to 630 PLOT the actual graph with the cubes at the bottom designating the division markers of the individual entries. The highest sales entry will be at the upper left of the screen and the entries from 0 to the total will be on the third line.

Subroutine 300 will plot the data points when they are going up and subroutine 400 will plot the data points when they are going down.

Subroutine 500 will plot the points to connect the data points when going up and subroutine 600 will plot the points to connect the data points when going down.

The sample graph shown on the cover represents a close approximation of sales of the ZX/TS 1000 series computers, starting in August of 1982 to present.

```
10 DIM S(24)
20 FOR N=1 TO 24
30 INPUT S(N)
40 IF S(N)=0 THEN GOTO 80
50 SCROLL
60 PRINT N,S(N)
70 NEXT N
80 LET R1=N-1
100 LET A=0
110 FOR N=1 TO R1
120 IF S(N)>A THEN LET A=S(N)
130 NEXT N
140 PRINT AT 21,1;0;AT 1,1;A
150 CLS
200 FOR N=4 TO R1*2 STEP 2
210 LET Y=(S(N/2)/A)*43
215 IF C=4 THEN GOTO 230
220 PLOT N+2,Y
230 GOSUB 300
240 PRINT AT 21,N/2+1;
    CHR$(4)
250 NEXT N
260 PRINT AT 3,3;1;AT 3,R1+1
    ;R1;AT 0,0;A;AT 21,0;0
270 PAUSE 40000
280 CLS
290 GOTO 200
300 LET Z=(S(N/2+1)/A)*43
310 IF Z<Y THEN GOTO 400
320 LET X=Z-Y
330 FOR C=1 TO 3
340 GOSUB 500
350 PLOT N+C+2,Y+C*X/3
360 NEXT C
370 RETURN
400 LET X=Y-Z
410 FOR C=1 TO 3
420 GOSUB 600
430 PLOT N+C+2,Y-C*X/3
440 NEXT C
450 RETURN
500 FOR D=Y+((C-1)*X/3)
    TO Y+((C)*X/3)
510 PLOT N+C+2,D
520 NEXT D
530 RETURN
600 FOR D=Y-((C-1)*X/3)
    TO Y-((C)*X/3) STEP-1
610 PLOT N+C+2,D
620 NEXT D
630 RETURN
```

Class dismissed!

The hare is larger, heavier and longer in the ear than the rabbit.

(2068 WON'T GET CONT.)

can't find out from Timex what the real sales picture is. I bet the truth is a lot closer to the second scenario.

This is a paradox for sure - computers at present, with little support and even less in the future, yet with the potential for fantastic power. People tell me all the time that the TS-2068 is ahead of its time. There is nothing in the price bracket that can compare with it.

It's like taking your automobile back to the year 1800 - The roads exist, but you will soon run out of gas - Ed.

Dear Ed,

Does anyone have an EDITOR/ASSEMBLER for the TS-2068? Now that Timex has pulled the plug, I find most companies out of business, let alone one with this type of program.

Help!

G. Cheevers - Porland OR

Dear Gene,

Keep the faith!

Although I have not seen the new 2068 version, I was quite happy with the 1000 version of HOT Z from SINWARE (BOX 8032, Santa Fe, NM, 87504).

This package (HOT Z-II $24.95 + $2.00 p/h) allows you to assemble, disassemble, label, relocate, single step and print & save listings with this single multi-purpose utility program - Ed.

Dear Ed,

I have tried to convert some programs written for the TS-1000 to work on the TS-2068. I don't have any problems until the PLOT/UNPLOT commands occur and then I'm lost.

There are two parts to the problem:

#1 - is there a simple formula to convert the X/Y axis positions and,

#2 - how do I simulate UNPLOT?

Sincerely,

P. Estaban - San Francisco CA

Dear Peter,

I like nice simple questions like this. First of all, the old 1000 X/Y axis co-ordinates allowed 44 up/down by 64 across. The new TS-2068 co-ordinates allow 176 up/down by 256 across. The conversion ratio is the same for both axis since there are four times as many pixel positions across or down on the 2068 than on the 1000. Therefore, if we multiply our PLOT co-ordinates in the 1000 program version by the number 4, the screen positions on the 2068 will now correspond with the 1000.

The plotted pixels on the 2068, are of course, much smaller which gives higher screen definition.

To UNPLOT, all we do is first change the INK color to whatever the PAPER color is and then PLOT the same pixel location and the dot will disappear. Just make sure that that PLOT command is followed by another INK command to make the PLOT or PRINT commands that follow work properly - Ed.

Dear Ed,

On the TS-1000, if numbers are POKEd into an area of memory above RAMTOP, typing NEW will erase any variables or program lines but the numbers above RAMTOP will still exist in memory.

Not owning a TS-2068 but thinking of purchasing one, I was wondering if this condition was also true with the TS-2068?

E. Carter - Topeka KS

Dear Evelyn,

No! When NEW is entered, the TS-2068 resets itself and all information is lost. It has the same effect as turning the on/off switch off and on.

Also, any numbers POKEd into memory above the program area, will not be saved on tape, although variables in memory will be saved.

However, a routine that POKEs machine code into memory can be MERGEd into another program (providing they don't occupy any of the same line numbers) and the new version can be saved in its entirety. This procedure allows much more flexibility because you don't have to keep writing the same machine code routine into new programs - Ed.

STICK IT TO TIMEX

Unlike what the title may infer, this article is about the STICK command on the TS-2068.

We have received some inquiries and complaints regarding this command in that it doesn't work the way the manual explains it. First of all, the Joystick port is on the left side of the computer on the other side of the ON/OFF switch.

On page 173, an example is given:

```
IF STICK (1,2)=1 THEN LET
X=X+1
```

Let us change this example as follows:

```
IF STICK (1,a)=b THEN LET
X=X+1
```

One might assume that this is the proper command to detect movement of the joystick. The two numbers following the STICK command have special purposes. The first (1) designates that the device plugged into the port is a joystick. The second number (a) designates which port the joystick is plugged into. The one on the left is the #1 port and the one on the opposite side of the computer is the #2 port. If you write a program, make sure your joystick is plugged into the correct port.

On pages 174 and 175 we have the joystick direction codes. If (b) is the value of one of these codes, a truism in the line occurs and whatever commands that follow, will execute.

The following program is a good example of how the STICK command can create fast moving action:

```
10 LET x=0: LET y=0
30 OVER 1
1000 PRINT AT x,y;"■"
1010 IF STICK (1,1)=0
     THEN GOTO 1000
1020 PRINT AT x,y;" "
1100 IF STICK (1,1)=8 THEN
     LET y=y+1: GOTO 1200
1110 IF STICK (1,1)=4 THEN
     LET y=y-1: GOTO 1200
1120 IF STICK (1,1)=1 THEN
     LET x=x-1: GOTO 1200
1130 IF STICK (1,1)=2 THEN
     LET x=x+1: GOTO 1200
1140 IF STICK (1,1)=5 THEN
     LET x=x-1: LET y=y-1:
     GOTO 1200
1150 IF STICK (1,1)=10 THEN
     LET x=x+1: LET y=y+1:
     GOTO 1200
```

```
1160 IF STICK (1,1)=6 THEN
     LET x=x+1: LET y=y-1:
     GOTO 1200
1170 IF STICK (1,1)=9 THEN
     LET x=x-1: LET y=y+1:
     GOTO 1200
1200 IF x>21 THEN LET x=21
1210 IF x<0 THEN LET x=0
1220 IF y<0 THEN LET y=0
1230 IF y>31 THEN LET y=31
1240 GOTO 1000
```

Try the program with and without line 30. With line 30, the blinking cursor will change the paper color to the opposite of what it was, black or white. Make sure your joystick is plugged into port #1. If you want to delete line #30, make sure you issue the "OVER 0" command.

Re-write the program as follows:

1000 PLOT x,y
- delete lines 30 and 1020
- change the "21"s in line 1200 to 255
- change the "31"s in line 1230 to 175

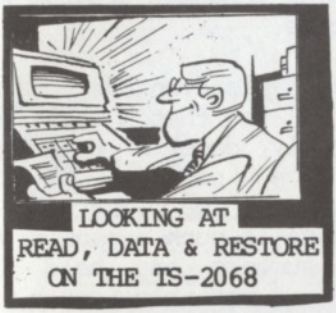
You will have to hold the joystick 90 degrees counter-clockwise to get the correct plot directions, or you can re-write lines 1100-1170 to receive the proper values.

Inexpensive joysticks can be purchased from most computer stores. I bought one for the Commodore 64 for less than $10.00 and it plugged right in.

You can, of course, write a program that allows for two joysticks to be plugged in at the same time to create interesting two-player game situations - Ed.

(READ, DATA, RESTORE)

machine language program into high memory. It is also a lot easier for the programmer to reference the DATA numbers to a mnemonics chart to see their functions than it is to study the gobbledeegook held in a REM statement such as the methods commonly used with the TS-1000.



LOOKING AT
READ, DATA & RESTORE
ON THE TS-2068

In past issues, we have read articles on how to simulate the commands READ, DATA and RESTORE. Many of us have never used the real thing and wonder what the hub-hub is all about.

We have been led to believe that a BASIC program executes itself with the computer reading program lines by the numerical line numbers starting with the lowest number and executing the commands in that line and then moving on to the next number and so on. The program will continue to do this unless a GOTO or GOSUB command is encountered which tells it to jump to another higher or lower line number.

This has a certain amount of truth to it but in actuality, the computer is aware at all times of every line and everything that is in that line. There are commands which can demonstrate this effect. The following program is such an example:

```
10 INPUT "Do you want to
   restore? ";a$: IF a$(1)
   ="y" THEN RESTORE
20 READ a$: PRINT a$
30 GOTO 10
40 DATA "APPLE","BANANA",
   "CHERRY","DATE","EGG",
   "FEMALE","GOD","HAIR",
   "JUMPER"
```

If we observe the listing of the program and follow the logic, we can see that at no time is line 40 going to be executed. One may argue that the READ command acts as a GOSUB but this is not true - there is no line number destination for READ to identify with. The DATA line can be anywhere in the program - at the beginning, end or anywhere in between. If the DATA line is encountered during normal execution, it is ignored the same way REM is ignored. The line is simply skipped over.

If we RUN this program and respond to each prompt with the ENTER key being pressed, the words in the data line will be displayed one at a time. If we enter "yes" for the prompt, the next displayed word will be the first in the DATA line because the DATA pointer will be RESTOREd to that position.

If we wished to put numbers in a DATA line, we would leave out the quotation marks and have line #20 changed to:

(continued on page 12)

```
20 READ a: PRINTa
```

More than one DATA line can be entered but the items in the lines are treated as if they were all in one big line and in order as they appear in the program.

Uses for READ, DATA and RESTORE are many, but one of the most common uses is to POKE a machine language routine into memory. Let us say that we had a routine which involved certain numbers to be put into certain memory locations. Let us say that the numbers were 156, 32, 222, 118, 255, 7, 45, 2, 89 and 201 (not a real machine language routine) and they were to be put in consecutive memory locations starting with location 30,000. Now with the Timex computers, we could put these numbers into a variable array,and POKE them into memory with the following routine.

```
10 DIM A(10)
20 FOR N=1 TO 10
30 INPUT A(N)
40 NEXT N
50 FOR N=1 TO 10
60 POKE 29999+N, A(N)
70 NEXT N
```

If we ran this program, we could input the numbers and after the last one was entered, the routine would be POKEd into memory. If we then entered RAND USR 30000, the machine language program would execute.

The disadvantage of this method is that we cannot directly observe the numbers in the program listing. Therefore, we might write the routine in such a manner where the numbers are held in a string variable such as described in previous articles regarding the simulation of READ, DATA & RESTORE. The disadvantages of these methods is that a more complicated routine has to be written to split the string variable apart into the proper data item segments. The above numbers have 1, 2 and 3 characters which would make a routine take up a lot of program lines and space. We could convert these numbers to hexadecimal which would mean that each one would occupy exactly 2 spaces and a routine to POKE them into memory would be easy to write. However, a routine to convert the numbers into hexidecimal would be something else.

But with READ, DATA and RESTORE, all you need is:

```
10 DATA 156,32,22,118,255,
   7,45,2,89,201
20 FOR n=1 to 10
30 READ a: POKE 29999 + n, a
40 NEXT n
```

This represents an easy and efficient method of putting a

WHAT THE TS-2068 OWNER WON'T BE ABLE TO GET

What did we lose when Timex decided to get out of the computer market? Here are a smathering of products that were planned. Some made - most didn't. The ones that did are in short supply:

- High resolution color monitor for under $200.00. Word has it that Timex was in final contract negotiations with a manufacturer to produce a high quality 9 inch monitor.

- Micro-drives for $65.00 each, working on the principle of closed-loop high-speed tape storage in miniature. 100K of program/data could be held on a single wafer-disk.

- Expansion interface for $120.00. This device would allow connecting ports for a parallel printer, RS-232 devices with selectable baud rate, controller for up to 8 of the micro-drives, standard composite video port, RGB video port, networking capability to allow up to 64 TS-2068s to connect together, optional 32K extra RAM, CP/M mode and an auxilary audio output jack.

- High quality 7 X 8 dot-matrix letter-quality ink printer for $325.00. This printer prints at 80 characters per second and the print quality is comparable to a high quality typewriter and would also support the 2068 graphics.

The computer, recorder and phone modem are being sold but other items "in the works" were supposed to be developed but never were, such as 512K RAM extension and hard disk drive.

Why?

Do we accept Timex's explanation regarding the market uncertainty? Some sources say Timex sold over 100,000 of these computers with very little advertising expense, before they decided to back out. In a 4 month period, this might be considered very successful.

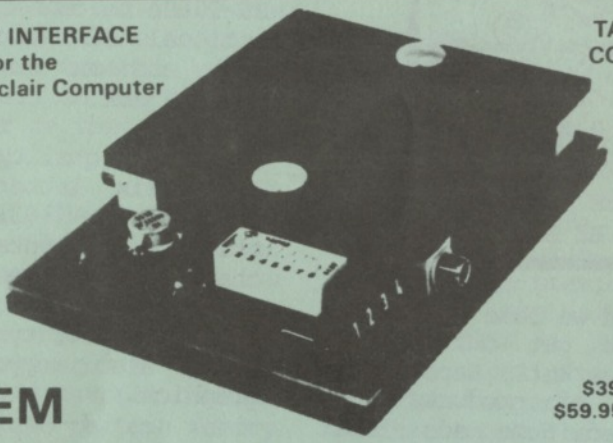
Other sources say that less than 20,000 were sold in that time frame, with tremendous advertising expense.

One thing is for sure! We

(continued on page 8).

ANALOG INTERFACE
for the
Timex/Sinclair Computer

TAPE SIGNAL CONDITIONER



VOTEM

$39.95 (Kit)
$59.95 (A & T)

VOTEM is a complete package consisting of hardware and software that enables your computer to measure, display and record "real world" analog signals. Your computer can monitor any physical phenomenon (pressure, light, temperature, etc.) that can be represented by a DC voltage. A probe is provided for air and liquid temperature measurements.

Your computer becomes a "smart" digital voltmeter and thermometer with storage capability. Just think of the possible applications. Use VOTEM and your computer to monitor the temperature in a home energy conservation project to save money and possibly qualify for an energy tax credit on the entire system.

VOTEM also amplifies and cleans up the tape signal for reliable program LOADing. The tape signal conditioner circuit will allow you to LOAD tapes with a lower volume setting on your tape recorder, resulting in less noise and more dependable LOADs. You will be able to LOAD from tapes which would previously not comply.

VOTEM requires no modifications to your computer and does not use the computer's expansion connector, leaving it free for other add-ons such as the memory pack and printer.

At only $59.95 (assembled and tested), VOTEM is the world's most cost effective analog interface. For an even better bargain the VOTEM kit is only $39.95. (Requires soldering and appx 2 hrs.) VOTEM comes with a detailed 35-page manual. The manual may be purchased separately for $5 pp and applied to first purchase of a VOTEM unit. If you are not satisfied with VOTEM return within 15 days for a full refund. (Does not apply to kits.) **Send check or money order plus $3 for shipping and handling.**

VOLTAGE MEASUREMENT PERFORMANCE

Resolution	0.000044V (better than 14 bits.)
Accuracy (note 1)	+/- 0.2%
Input Resistance	250 Megohms
Range (note 2)	0 to +1V (without divider network)
Linearity	0.1%

TEMPERATURE MEASUREMENT PERFORMANCE (specified in degrees C)

Resolution	better than 0.05
Accuracy (note 1)	+/- 0.5
Range	-25 to +125

POWER SUPPLY REQUIREMENTS (note 3)

Operating Voltage	+8V to +15V (unregulated DC)
Current Consumption	25mA (typical) 15mA without LED

Note 1: All calibration is done in software. The absolute accuracy of VOTEM will depend mainly on the choice of parameters and conversion factors used in the software. If the calibration procedures provided with VOTEM are followed then the accuracy should be as good or better than that specified above.
Note 2: The input voltage range of 0 to+1V can easily be expanded with an on-board resister voltage divider network.
Note 3: VOTEM can be powered from the Timex/Sinclair computer's power supply. The VOTEM unit provides a power-in and power-out receptacles and also includes the proper connecting cable.

COMPUTER REQUIREMENTS

Timex TS-1000 or Sinclair ZX81. Will also work on ZX80 (w/8K-ROM). Basic measurements and operations require only 1K of RAM memory. Instructions and Z80 source code driver routine are provided for adapting to any Z80 based computer.

OTHER FEATURES

* Schmitt trigger conditioner circuitry for tape signal
* LED tape LOAD monitor
* Buffered audio output for speaker or earphone
* Can be used as frequency counter from DC to beyond 30KHz
* Functions are easily selected with 8-pole DIP switch
* Self-contained in attractive (1" by 3" by 4") enclosure
* Temperature probe for air and liquid temperature measurements
* Glass-epoxy circuit board and high quality components used.
* Input connections are reliable miniature screw terminals.
* Instructions for interfacing to any Z80 system with 1-bit input.
* Easy-to-follow, 35-page manual can be purchased separately.

Down East Computers

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